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A PRISON/PAROLE SYSTEM SIMULATION MODEL

by

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ABSTRACT

The continued high incidence of crime is recognized as being a serious national problem. Much controversy surrounds the estimated effects of policy changes within the Criminal Justice System. The following paper presents a methodology for analyzing the effects of possible policy changes in a state's prison/parole system on future prison and parole populations. A simulation model is presented, viewing a prison/parole system as a feedback process for criminal offenders. Transitions among the states in which an offender might be located, IMPRISONED, PAROLED, and DISCHARGED, are assumed to be in accordance with a discrete time semi-Markov process. Projected prison and parole populations for sample data and applications of the model are discussed.

Prepared by:

A PRISON/PAROLE SYSTEM SIMULATION MODEL

I. INTRODUCTION.

Crime today is recognized as being one of this country's most serious domestic problems. Law enforcement officials and criminal justice agencies are concerned with the implications for the future if present crimes rates continue unchecked. Much has been written about the inadequacies existing in our Criminal Justice System and correctional systems have been accused of failing to effectively rehabilitate large numbers of criminal offenders. Of particular concern is the high percentage of offenders released from the nation's prisons who eventually are reimprisoned and usually within a short period following release. Methods of crime deterrence have been hotly argued. Does harsher punishment (e.g. longer prison sentences) dissuade, to any extent, offenders from continuing a life of crime? Would more liberal parole policies reduce (or increase) recidivism? Criminal justice agencies are also becoming concerned with the number of people beginning criminal careers each year. Uncertainty exists as to whether the number of 'first offenders' in a year is a relative constant, a fixed percentage of all offenses in a year, or some function of a state or the country's population.

Operations researchers have only in the past ten years begun to direct effort to problems in the Criminal Justice System. The President's Commission on Law Enforcement and the Administration of Justice emphasized in their report of 1967 the need for research into police, court and correctional problems. Alfred Blumstein and Richard Larson in Reference [1] have constructed a feedback model of the total Criminal Justice System. Probability of rearrest is represented as a decreasing function of age and a Markovian crime-switch matrix is employed. The results include an estimated cost distribution by crime type and estimated criminal career costs. Jacob Belkin, et al. in Reference [2] have considered the feedback properties of recidivism, but no differentiation was made between types of release (conditional or unconditional) or the reasons for which an offender could be rearrested (i.e. for violating parole, for committing a crime on parole, or for committing a crime after discharge). Also in this model the distributions for the times from release to rearrest are assumed to be constant, and then varied parametrically. Paul Gray and James Pittman in Reference [3] have considered a Markov model for the flow of prisoners through a state's prison system. The purpose of their model is to predict the effectiveness of correctional programs.

The problem considered here is that of forecasting the number and the distribution of a state's prisoners and parolees. The purpose of this forecasting is to provide criminal justice agencies, particularly correctional officials, projections of future prison and parole populations and provide methodology for investigating the effects of possible prison and/or parole policy changes. The methodology presented is a simulation model. Three states in which an offender in the prison/parole system can be located are considered: IMPRISONED, PAROLED, and DISCHARGED (from prison or parole). The possible transitions among the states are assumed to be in accordance with a discrete time semi-Markov process. The projected prison and parole populations are plotted versus time (in year) for some sample data and the applications of the model are discussed.

II. MODEL DESCRIPTION.

A. Semi-Markov Model.

The transitions made by a member of the Criminal Justice System (CJS) will be modeled as a Semi-Markov Provess. Simply stated, this entails transitions from state to state in accordance with specified transition probabilities as well as a specification of the distribution of time spent in each state. A special case is the Markov model which is less general, and as we shall see shortly, less realistic.

Let us view a member of the CJS as being in one of the following eight states:

0 - Imprisoned for first offense,
1 - Discharged from prison,
2 - Paroled from prison,
3 - Reimprisoned after parole violation,
4 - Reimprisoned after new crime while on parole,
5 - Discharged from parole,
6 - Reimprisoned after previous discharge,
7 - Clean (appropriately defined at end of section).

Thus the total prison population consists of states 0, 3, 4 and 6. The transition matrix is as follows:

$$P = \begin{array}{c} \\ 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{array} \begin{array}{c} \begin{array}{cccccccc} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \end{array} \\ \begin{bmatrix} 0 & P_{01} & P_{02} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & P_{16} & P_{17} \\ 0 & 0 & 0 & P_{23} & P_{24} & P_{25} & 0 & 0 \\ 0 & P_{31} & P_{32} & 0 & 0 & 0 & 0 & 0 \\ 0 & P_{41} & P_{42} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & P_{56} & P_{57} \\ 0 & P_{61} & P_{62} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \end{array}$$

An advantage of such a finely defined state space is that is allows for different transition probabilities into states 1 and 2. (i.e. $P_{i1} \neq P_{j1}$ and $P_{i2} \neq P_{j2}$)

If the above matrix represented transition probabilities for a Markov Chain, then the time spent in prison would in every case be exactly one year; and if we were to compensate by allowing $P_{jj} > 0$ for $j = 0,3,4,6$, then the time spent in prison would be geometrically distributed. Since the geometric probability mass function has the lack of memory property, this implies that one's chances of leaving prison do not improve at all over time. We can remedy this state of affairs by turning to a semi-Markov model with state holding times which have some general distribution to be estimated from past data.

Let T_i total time spent in state i before leaving, and let "$i \to j$" represent the event describing the next transition as being from i to j. Define $F_{ij}(n)$, $Q_{ij}(n)$, $H_i(n)$ and $P_{ij}(n)$ as follows:

$$F_{ij}(n) \equiv P[T_i \leq n \mid i \to j]$$

$$Q_{ij}(n) \equiv F_{ij}(n) \cdot P_{ij} \equiv P[T_i \leq n \text{ and } i \to j]$$

$$H_i(n) \equiv P[T_i \leq n] = \sum_j Q_{ij}(n)$$

$$P_{ij}(n) \equiv P[i \to j \mid T_i > n] = \frac{P_{ij}[1 - F_{ij}(n)]}{1 - H_i(n)}$$

for $n = 0,1,2,\ldots$

Clearly $F_{ij}(\infty) = 1$, $Q_{ij}(\infty) = P_{ij}$ and $H_i(\infty) = 1$ for all i.

The model therefore, requires specification of (P_{ij}) and $\langle F_{ij}(n) \rangle$ --the quantities most readily estimated from existing data. To accommodate a reasonable definition for the "clean" state (state 7), we may arbitrarily choose a threshold time N for which

$$F_{i7}(n) = \begin{cases} 1 & \text{if} \quad n \geq N \\ 0 & \text{if} \quad n < N \end{cases}$$

Thus, one is "clean" only after being out of prison for a length of time N.

B. Flow Diagram.

Figure 1 represents the flow of offenders into the system, the possible routes from state to state, and flow out of the system.

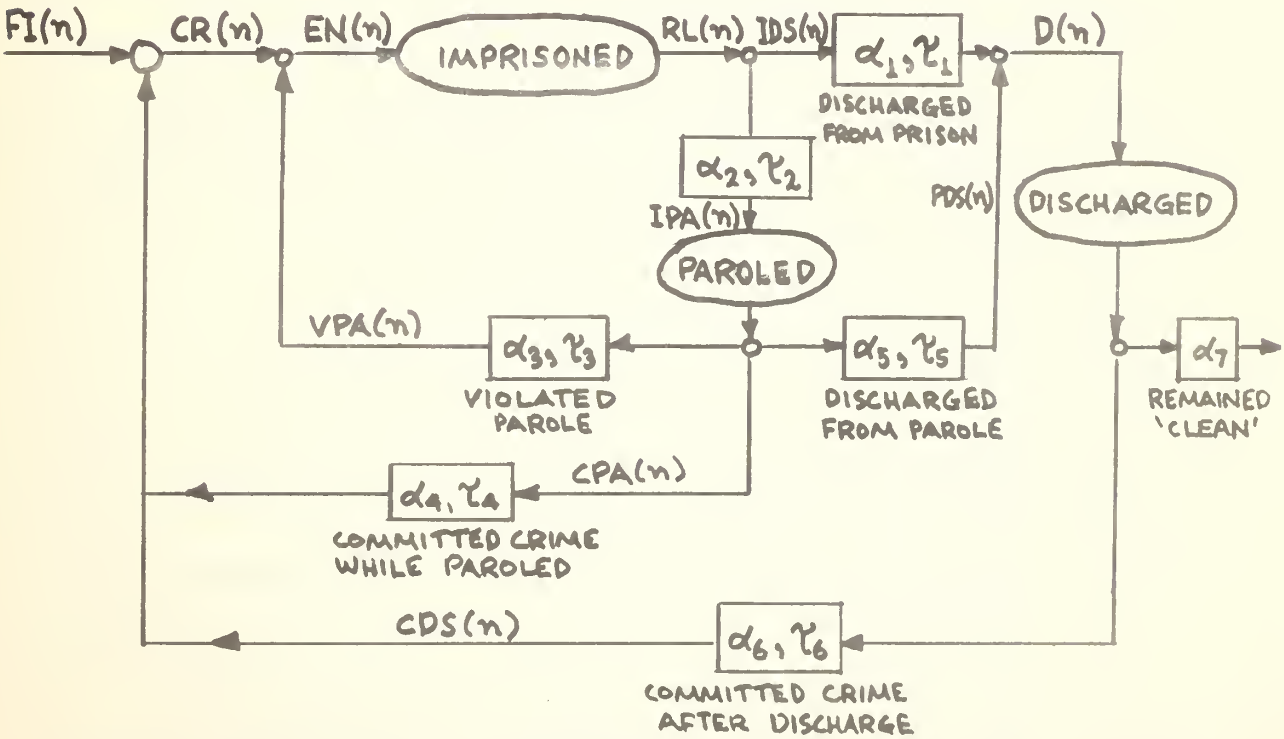


Figure 1.

C. Definition of Variables.

The variable names in Figure 1 represent the various amounts of flow along the routes. These variables are defined as the following:

FI(n) = Number of first offenders imprisoned in year n,

CR(n) = Number imprisoned for a new crime in year n,

EN(n) = Number entering prison in year n,

RL(n) = Number released from prison in year n,

DS(n) = Number discharged (from prison or parole) in year n,

IP(h,n) = Number who had been in prison between h - 1 and h years who were paroled in year n, $h = 1,\dots,N_i$,

ID(h,n) = Number who had been in prison between h - 1 and h years who were discharged in year n, $h = 1,\dots,N_i$,

PD(g,n) = Number who had been on parole between g - 1 and g years who were discharged in year n, $g = 1,\dots,N_p$,

CP(g,n) = Number who had been on parole between g - 1 and g years who committed a new crime in year n, $g = 1,\dots,N_p$,

V(g,n) = Number who had been on parole between g - 1 and g years who violated parole in year n, $g = 1,\dots,N_p$,

CD(kk,n) = Number who had been discharged between kk - 1 and kk years who committed a new crime in year n, $kk = 1,\dots,N_d$,

IPA(n) = Number paroled from prison in year n,

IDS(n) = Number discharged from prison in year n,

PDS(n) = Number discharged from parole in year n,

VPA(n) = Number reimprisoned for violating parole in year n,

CPA(n) = Number reimprisoned for committing a new crime while paroled in year n,

CDS(n) = Number reimprisoned for committing a new crime after discharge in year n,

IN(n) = Total number in prison at start of year n,

K(h,n) = Number of prisoners having already served between h - 1 and h years at start of year n, $h = 1,\dots,N_i$,

$PA(n)$ = Total number on parole at start of year n,

$L(g,n)$ = Number of parolees having already been on parole between $g - 1$ and g years at start of year n, $g = 1,\ldots,N_p$,

$XC(n)$ = Total number of ex-convicts (dischargees) at start of year n,

$M(kk,n)$ = Number of ex-convicts having already remained 'clean' between $kk - 1$ and kk years at the start of year n, $kk = 1,\ldots,N_d$.

D. Distributions of the Times to Transition.

For those offenders just entering a state, the time until a transition out of the state occurs depends on the state chosen. As the model utilizes discrete time semi-Markov properties, a year is assumed to be the time step. All transitions of offenders from state to state occurring during a year are assumed to occur simultaneously at the end of a period of a year. Maximum limits to the amount of time spent in any state are to be set according to actual correctional data. As the vast majority of offenders spend short amounts of time per crime in either the IMPRISONED or PAROLED state, the maximum number of years per crime that an offender can be imprisoned is assumed to be N_i years. Likewise, N_p years is assumed to be the maximum length of a parole period for any one crime. N_d years is initially set as the maximum number of years that an offender can spend in the DISCHARGED state. If an offender commits no further crime in a period of N_d years after entering the DISCHARGED state, he is assumed to remain 'clean' for the remainder of his lifetime and, therefore, leaves the system.

As an illustration, consider an offender just entering the IMPRISONED state. His next state is chosen with a probability initially assumed to be independent of how long he spends in the IMPRISONED state. But once his next state is chosen, assume it is the DISCHARGED state, the number of years until this transition occurs is determined in the following manner.

Let $\alpha_1(h)$ = Prob (discharged within the next year | discharged and have already been in prison between $h - 1$ and h years),

Let $\beta_1(h) = 1 - \alpha_1(h)$.

The probability $\alpha_1(h)$ is assumed to be an increasing function of h, the number of years already served in prison. This mean, for example, that an offender already imprisoned for between 4 and 5 years is more likely to be released in the next year as is an offender who has only been in prison between 1 and 2 years.

Let $\alpha_1(N_i) = 1.0$ and $\beta_1(N_i) = 0$.

This, then, reflects the assumed maximum imprisonment term of N_i years. Then,

let $\tau_1(h)$ = Time in years between imprisonment and discharge given the offender is discharged and has already spent between $h - 1$ and h years in the IMPRISONED state.

For those offenders just entering the IMPRISONED state, then, $h = 1$ and given that he is eventually discharged, the time until his discharge is

$$\tau_1(1) = \begin{cases} 1, & \text{with probability } \alpha_1(1) \\ 2, & \text{with probability } \beta_1(1)\alpha_1(2) \\ 3, & \text{with probability } \beta_1(1)\beta_1(2)\alpha_1(3) \\ \vdots & \\ N_i-1, & \text{with probability } \beta_1(1)\ldots\beta_1(N_i-2)\alpha_1(N_i-1) \\ N_i, & \text{with probability } \beta_1(1)\ldots\beta_1(N_i-1)\alpha_1(N_i) \end{cases}$$

In general, for an offender who has already been imprisoned between $h - 1$ and h years, the time until he is discharged given that he is eventually discharged is

$$\tau_1(h) \begin{cases} 1, & \text{with probability } \alpha_1(h) \\ 2, & \text{with probability } \beta_1(h)\alpha_1(h+1) \\ \vdots & \\ N_i+1-h, & \text{with probability } \beta_1(h)\ldots\beta_1(N_i-1)\alpha_1(N_i) \end{cases}$$

That this is a valid probability mass function is shown in the following

$$\begin{aligned}\sum_{k=1}^{N_i+1-h} \Pr[\tau_1(h)=k] &= \alpha_1(h) + \beta_1(h)\alpha_1(h+1) + \ldots + \beta_1(h)\ldots\beta_1(N_i-1)\alpha_1(N_i) \\ &= \alpha_1(h) + \beta_1(h)\{\alpha_1(h+1) + \beta_1(h+1)[\ldots \\ &\qquad (\alpha_1(n_i-1) + \beta_1(n_i-1)[\alpha_1(N_i)])\ldots]\} \\ &= 1.0\end{aligned}$$

since $\alpha_1(N_i) = 1.0$ by assumption.

Thus, for those offenders just entering a state, the next state will be chosen according to α_i and the time until transition will have a distribution $\tau_1(1)$. As the simulation will also consider those who at the outset have already spent between $k - 1$ and k years in a state, the next state for such offenders will likewise be chosen according to the probabilities α_i but the time until transition will have a distribution $\tau_i(k)$.

E. Relationships Among the Variables.

The following relationships are assumed to exist among the applicable variables defined in part C of this section. Referring to the flow diagram in part B of this section will aid in visualizing these expressions.

$$IPA(n) = \sum_{h=1}^{N_i} IP(h,n$$

$$IDS(n) = \sum_{h=1}^{N_i} ID(h,n)$$

$$PDS(n) = \sum_{g=1}^{N_p} PD(g,n)$$

$$CPA(n) = \sum_{g=1}^{N_p} CP(g,n)$$

$$VPA(n) = \sum_{g=1}^{N_p} V(g,n)$$

$$CDS(n) = \sum_{kk=1}^{N_d} CD(kk,n)$$

$$K(1,n+1) = FI(n) + VPA(n) + CPA(n) + CDS(n)$$

$$K(h,n+1) = K(h-1,n) - ID(h-1,n) - IP(h-1,n), \quad h = 2,\ldots,N_i$$

$$IN(n) = \sum_{h=1}^{N_i} K(h,n)$$

$$L(1,n+1) = IPA(n)$$

$$L(g,n+1) = L(g-1,n) - CP(g-1,n) - PD(g-1,n) - V(g-1,n),$$

$$g = 2,\ldots,N_p$$

$$PA(n) = \sum_{g=1}^{N_p} h(g,n)$$

$$(1,n+1) = IDS(n) + PDS(n)$$

$$M(kk,n+1) = M(kk-1,n) - CD(kk-1,n), \quad kk = 2,\ldots,N_d$$

$$CR(n) = FI(n) + CPA(n) + CDS(n)$$

$$EN(n) = K(1,n+1) = CR(n) + FI(n)$$

$$RL(n) = IPA(n) + IDS(n)$$

$$DS(n) = M(1,n+1)$$

$$IN(n+1) = IN(n) + EN(n) - RL(n)$$

$$PA(n+1) = PA(n) + IPA(n) - VPA(n) - CPA(n) - PDS(n)$$

$$XC(n+1) = XC(n) + DS(n) - CDS(n)$$

One of the purposes of the analysis is to determine the effects on future prison/parole populations of different expressions for the number of first offenders imprisoned each year, $FI(n)$. Initially, $FI(n)$ is assumed to be some fixed percentage of the total number of offenders entering prison in the previous year. That is it is assumed that

$$FI(N+1) = \frac{C}{100}[EN(n)] \quad \text{where} \quad 0 < C < 100$$

It will be interesting to also investigate other representations of $FI(n)$ perhaps as a constant and as a function of population (hence a function of n).

III. THE SIMULATION.

Before running the simulation of this PRISON/PAROLE, system data will be gathered to establish values for the parameters α_i and τ_i and initial values for a 'base' year, $n = 0$ (e.g. 1960) for the variables $K(h,n)$, $L(g,n)$, $M(kk,n)$ and $FI(n)$. The simulation will proceed by considering first each individual already imprisoned (or a sample of these) in the base year and projecting his criminal career for a large number of years (e.g. 1960-1999) or until he leaves the system (remains clean). After exhausting those in prison in the base year, those already on parole (or a sample of these) in the base year will be considered and their associated criminal careers will be projected. Next considered will be each individual who was in the discharged state ('clean') (or a sample of these) as of the base year and their associated criminal careers will be projected. Finally, the first offenders (or a sample of these) during the base year will be considered and their criminal careers will be projected. Estimates for the number of first offenders in succeeding years will be obtained and the associated criminal careers will be projected.

By recording the applicable accounting variables, the simulation will yield the projected PRISON/PAROLE/EXCONVICT populations by total number and the number in each subgrouping (i.e. $K(h,n)$, $L(g,n)$, and $M(kk,n)$) for each year n. The projected number of state-to-state transitions and the projected number of first offenders for each year n can also be recorded and plotted versus n. The projected criminal careers can include such estimates as the average number of imprisonments, average number of years imprisoned, average number of crimes committed on parole and after discharge, average length of a criminal career (for the first offenders considered), and average times between discharge or parole and reimprisonment.

IV. RESULTS FROM A SAMPLE RUN.

A sample run of this PRISON/PAROLE system simulation model was undertaken to obtain an idea as to the type of results to be expected. Purely arbitrary parameter values were used but some care was used in their selection so the values would hopefully not be significantly different than values obtained from actual correctional data. The model lends itself easily to adjust to any changes in transition probabilities, distributions of times to transition, initial prison and parole population distributions, and first offense representation.

The following transition probabilities were used:

$$\alpha_1 = 0.3 \qquad \alpha_4 = 0.3$$
$$\alpha_2 = 0.7 \qquad \alpha_5 = 0.5$$
$$\alpha_3 = 0.2 \qquad \alpha_6 = 0.7$$

The distributions for the times to transition, τ_i, were determined utilizing the method described in Part D Section II with the following expressions for the conditional probabilities:

$P_{id}(h)$ = Prob(discharged within next year | discharged and have already been imprisoned between $h - 1$ and h years)

$= (0.125)h, \qquad h = 1,\ldots,8$

$P_{ip}(h)$ = Prob(paroled within next year | paroled and have already been imprisoned between $h - 1$ and h years)

$= 0.2 + (0.10)h, \qquad h = 1,\ldots,8$

$P_v(g)$ = Prob(reimprisoned for parole violation within next year | reimprisoned for parole violation and have already been on parole between $g - 1$ and g years)

$= 0.4 + (0.12)g, \qquad g = 1,\ldots,5$

$P_{cp}(g)$ = Prob(reimprisoned for commission of crime on parole within next year | reimprisoned for commission of crime on parole and have already been on parole between $g - 1$ and g years)

$= 0.2 + (0.16)g, \qquad g = 1,\ldots,5$

$p_{pd}(g)$ = Prob(discharged from parole within next year | discharged from parole and have already been on parole between $g - 1$ and g years)

$= 0, \qquad g = 1,2$

$= 0.8 + (0.10)(g-3), \qquad g = 3,4,5$

$p_{cd}(kk)$ = Prob(reimprisoned for commission of crime after discharge within next year | reimprisoned for commission of crime after discharge and have already been discharged between $kk - 1$ and kk years)

$= 0.2 + (0.08)kk, \qquad kk = 1,\ldots,10$

The initial conditions were assumed to be

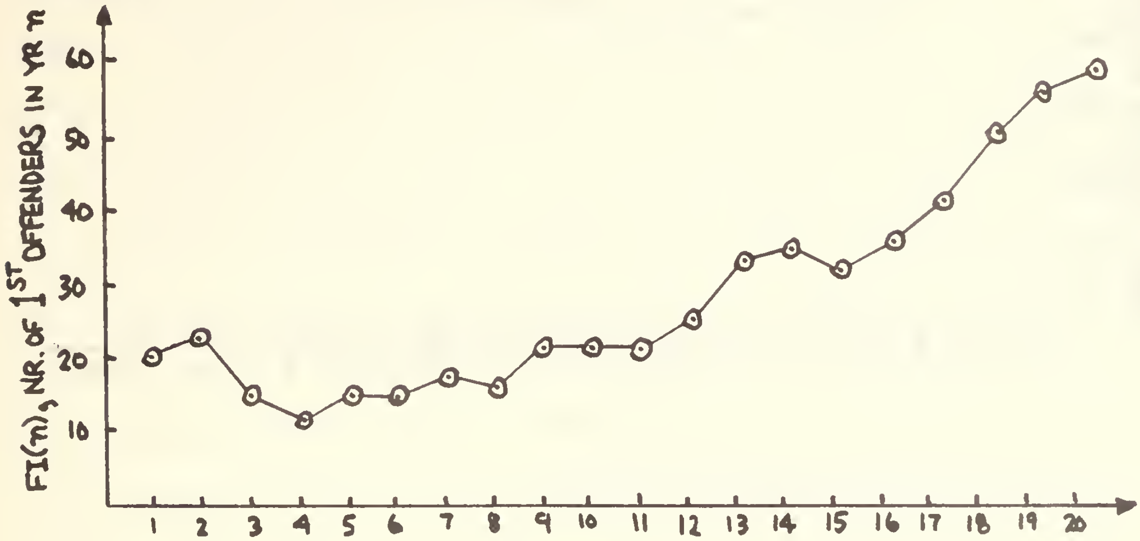
h	K(h,1)	g	L(g,1)	kk	M(kk,1)
1	50	1	48	1	32
2	25	2	36	2	20
3	20	3	20	3	16
4	10	4	12	4	12
5	6	5	4	5	12
6	5			6	8
7	3			7	8
8	1			8	6
				9	4
				10	2

Thus $IN(1) = PA(1) = XC(1) = 120$

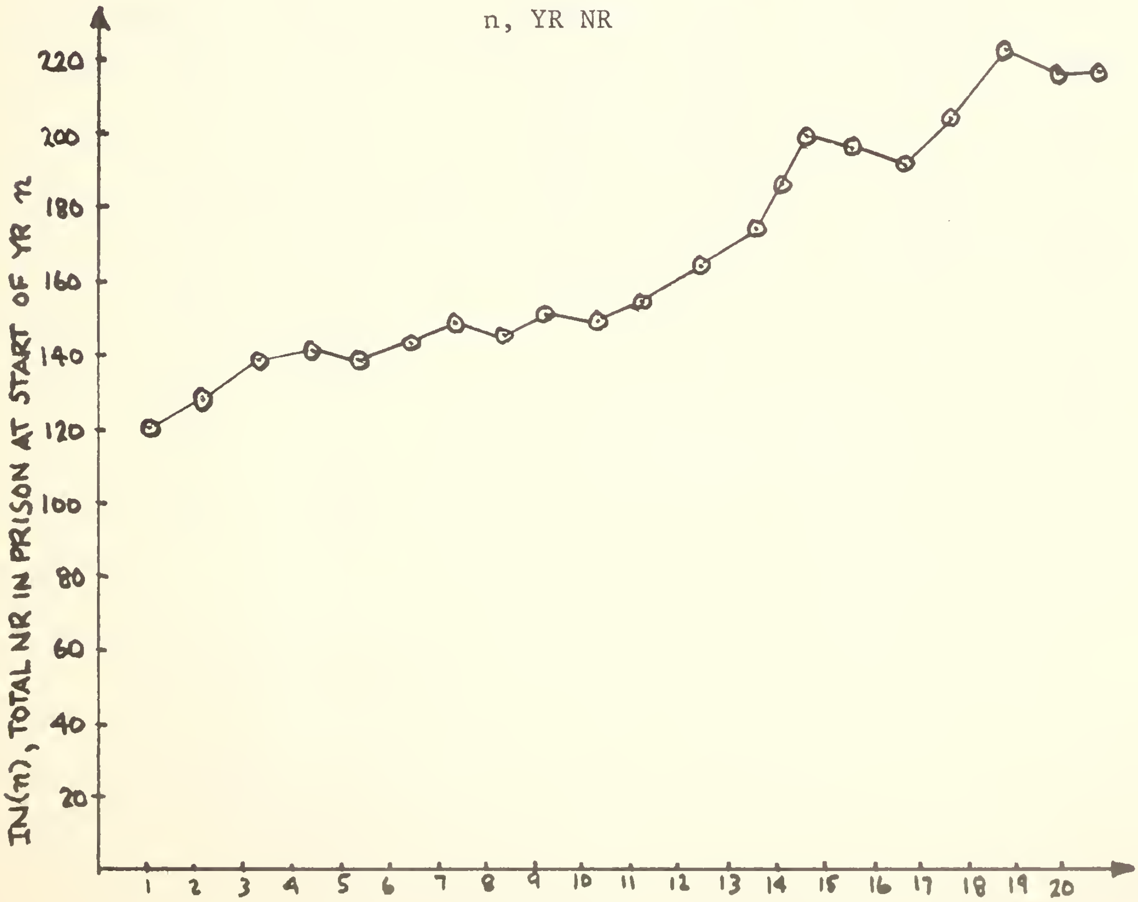
$FI(1) = 20$ and

$FI(n+1) = (0.2 + 0.02N)\cdot(EN(n)) \qquad n = 1,\ldots,20$

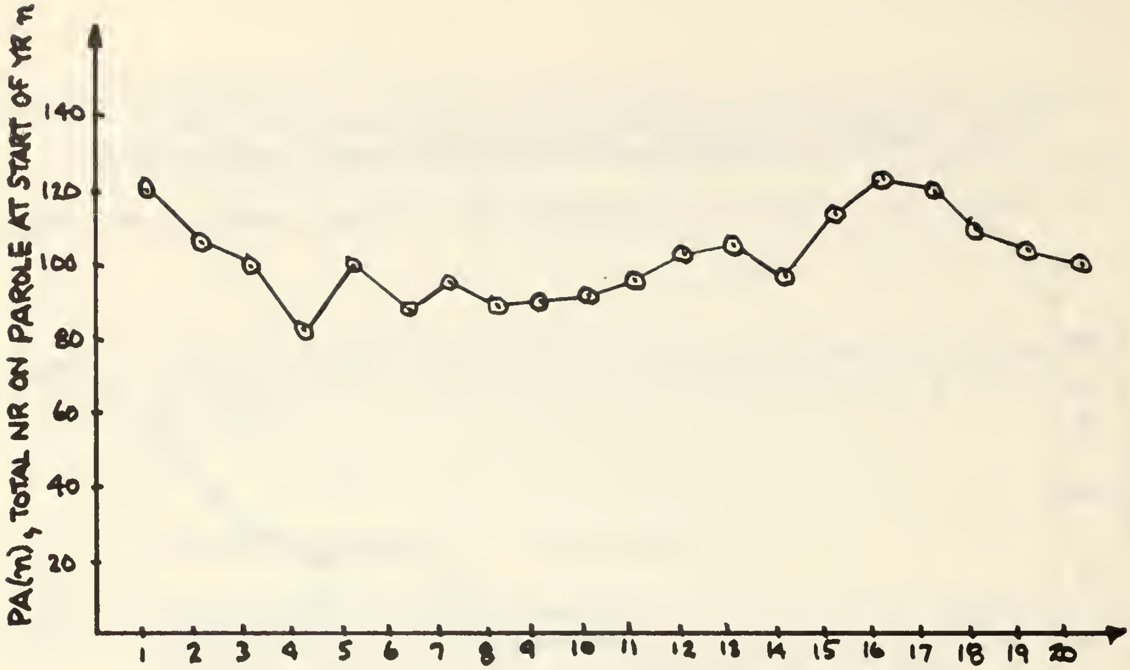
With these assumptions, the simulation model yielded among other things, the following projections for FI(n), IN(n), and PA(n) for n = 1,...,20



n, YR NR



n, YR NR



n, YR NR

As an illustration for year 15

h	K(h,15)	g	h(g,15)	kk	(kk,15)
1	67	1	48	1	42
2	61	2	28	2	58
3	33	3	31	3	53
4	21	4	7	4	23
5	8	5	1	5	24
6	4			6	16
7	1			7	14
8	0			8	12
				9	10
				10	13

V. APPLICATIONS.

The most interesting part of this research work lies in the possible applications and extensions of this PRISON/PAROLE simulation model. By systematically varying the parameters α_i and τ_i, individually or simultaneously, the model can assess the effects of changes in present prison/parole policies. The maximum number of years an offender can spend in the IMPRISONED or PAROLED state can be increased or decreased. The effects on prison and parole populations of different representations of the number of first offenders imprisoned in a year can be evaluated. The transition probabilities can be determined as a function of the number of years spent in a state. The transition probabilities and the distributions of the times to transition can also be made dependent on the number of times an offender has entered a state (e.g. reflect a higher probability of discharge and a longer imprisonment period for those offenders reimprisoned for new crimes). Average costs per year for prison/parole populations can be considered by the model and different policies can be compared.

REFERENCES

[1] Blumstein, A. and R. Larson, Models of a Total Criminal Justice System, Operations Research, Vol. 17, No. 2, Mar-Apr 1969, pp 199-232.

[2] Belkin, J., A. Blumstein and W. Glass, Recidivism as a Feedback Process: An Analytical Model and Empirical Validation, presented at the 41st National Meeting of ORSA, Apr 1972.

[3] Pittman, J. T. and P. Gray, Evaluation of Prison Systems, presented at the Joint National Meeting of ORSA, Inst. of MANSCI, and American Inst. of Industrial Engineers System Engineering Group, Nov 1972.

[4] Howard, R., Dynamic Programming and Markov Processes, The MIT Press, 1960.

[5] Ross, S. M., Applied Probability Models with Optimization Applications, Holden-Day, 1970.

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13. ABSTRACT

The continued high incidence of crime is recognized as being a serious national problem. Much controversy surrounds the estimated effects of policy changes within the Criminal Justice System. The following paper presents a methodology for analyzing the effects of possible policy changes in a state's prison/parole system on future prison and parole populations. A simulation model is presented, viewing a prison/parole system as a feedback process for criminal offenders. Transitions among the states in which an offender might be located, IMPRISONED, PAROLED, and DISCHARGED, are assumed to be in accordance with a discrete time semi-Markov process. Projected prison and parole populations for sample data and applications of the model are discussed.

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